WHAT IS CLAIMED IS:

1. A self-supported nitride semiconductor substrate having an X-ray diffraction half width of 500 seconds or less in at least one of a {20-24} diffraction plane and a {11-24} diffraction plane, and a diameter of 10 mm or more.

2. The self-supported nitride semiconductor substrate according to claim 1, wherein said nitride semiconductor is undoped, or n- or p-type, and has a carrier density of 1×10^{20} cm^{-3} or less.

3. A method for producing a self-supported nitride semiconductor substrate having an X-ray diffraction half width of 500 seconds or less in at least one of a {20-24} diffraction plane and a {11-24} diffraction plane, and a diameter of 10 mm or more, said method comprising (1) forming a first nitride semiconductor layer having a dislocation density of $10^n/cm^2$ ($0 < n \leq 10$) on a base substrate; (2) forming a mask layer made of another material than said nitride semiconductor on said first nitride semiconductor layer; (3) providing said mask layer with openings having an area of 10^{-n} cm^2or less, which penetrate said mask layer in a thickness direction, at a density of $10^{n-2}/cm^2$ or less; (4) forming a second nitride semiconductor layer having a thickness of 50 μm or more on said mask layer; and (5) removing layers ranging from said base substrate to said mask layer.

4. The method for producing a self-supported nitride semiconductor substrate according to claim 3, wherein said openings were at a density of $10^{n-4}/cm^2$ or less in said mask layer.

5. The method for producing a self-supported nitride semiconductor substrate according to 3, wherein the growing of said nitride semiconductor is carried out by a sublimation method, a metal-organic vapor phase epitaxy method, a hydride vapor-phase epitaxy method, liquid-phase epitaxy method or a combination thereof.

6. The method for producing a self-supported nitride semiconductor substrate according to claim 3, wherein said base substrate is made of a different material from that of said self-supported substrate.

7. The method for producing a self-supported nitride semiconductor substrate according to claim 3, wherein said first nitride semiconductor layer is formed on said base substrate via a buffer layer.

8. A light-emitting nitride semiconductor device comprising an epitaxial nitride layer with a light-emitting device structure formed on a self-supported nitride semiconductor substrate having an X-ray diffraction half width of 500 seconds or less in at least one of a {20-24} diffraction plane and a {11-24} diffraction plane, and a diameter of 10 mm or more.